Unesa Journal of Chemical Education
Vol, 3 No 3, pp 93-99, September 2014
ISSN: 2252-9454

DEVELOPMENT OF STUDENT WORKSHEET WHICH CONTEXTUAL APPROACH ORIENTED TO TRAIN CRITICAL THINKING SKILLS ON REACTION RATES SUBJECT MATTER IN STUDENT GRADE XI SENIOR HIGH SCHOOL

Fika Fajariyah Arifin, Harun Nasrudin
Jurusan Kimia, FMIPA, Universitas Negeri Surabaya
email: fika.arifin@gmail.com

Abstract

The aims of this research are to know the feasibility of student worksheet which contextual approach oriented to train critical thinking skills on reaction rates subject matter. Besides that, the aims of this research to know the critical thinking skills and response of students. The research method used R&D that consists of 10 steps. But in this research was just until limited trial. The student worksheet had been reviewed by 2 chemistry lecturers and 1 chemistry teacher and validated by 1 chemistry lecturer and 2 chemistry teachers then had been tested on 15 students in SMA Negeri 1 Kebomas. The result of this research showed that the student worksheet which contextual approach oriented to train critical thinking skills on reaction rates subject matter had been developed was feasibility to use. It was shown based on overall lecturer and teacher of chemistry assessment based on evaluation of contextual approach suitability, content, presentation, language and graphical in a row are 81,87%, 84,61%, 84,67%, 85,33%, and 84,76%. As well as student response was very positive based on evaluation of contextual approach suitability, content, presentation, linguistic and graphical in a row are 91,42%, 86,67%, 89,33%, 83,33%, dan 86,67% in good and very good category. Thus, student worksheet contextual approach oriented to train critical thinking skills reaction rates subject matterwas expressed very feasible and can be used.

Keywords: *Student worksheet, contextual approach, critical thinking skills, rates reaction*

Abstrak

Penelitian ini bertujuan untuk mengetahui kelayakan LKS berorientasi pendekatan kontekstual untuk melatihkan keterampilan berpikir kritis materi pokok Laju Reaksi. Selain itu, penelitian ini juga bertujuan untuk mengetahui keterampilan berpikir kritis dan respon siswa setelah menggunakan LKS yang dikembangkan. Rancangan penelitian yang digunakan adalah R&D yang terdiri dari 10 langkah. Namun pada penelitian ini hanya terbatas sampai enam langkah saja yaitu ujicoba produk. Telaah dilakukan oleh 2 orang dosen kimia dan 1 guru kimia dan divalidasi oleh 1 dosen kimia dan 2 guru kimia serta diujicobakan pada 15 siswa kelas XI SMA Negeri 1 Kebomas. Hasil penelitian menunjukkan bahwa LKS berorientasi pendekatan kontekstual untuk melatihkan keterampilan berpikir kritis materi pokok Laju Reaksi layak digunakan. Hal ini ditunjukkan dari persentase hasil penilaian dosen kimia dan guru kimia ditinjau dari aspek kesesuaian dengan pendekatan kontekstual, isi, penyajian, kebahasaan, kegrafisan secara keseluruhan memperoleh persentase berturut-turut sebesar 81,87%, 84,61%, 84,67%, 85,33%, dan 84,76%. Serta respon siswa yang sangat positif ditinjau dari aspek kesesuaian dengan pendekatan kontekstual, isi, penyajian, kebahasaan, kegrafisan secara keseluruhan memperoleh persentase berturut-turut sebesar 91,42%, 86,67%, 89,33%, 83,33%, dan 86,67%. Sehingga dapat disimpulkan bahwa LKS berorientasi pendekatan kontekstual untuk melatihkan keterampilan berpikir kritis materi pokok Laju Reaksi sangat layak dan dapat digunakan.

Kata kunci : *LKS, pendekatan kontekstual, keterampilan berpikir kritis, Laju Reaksi*

INTRODUCTION

Challenges of the future demands of learning should further develop higher order thinking skills or the abbreviated "HOTS" is one component in intelligence issues of the 21st century (The issue of 21st century literacy). In curriculum 2013, SI (Standar Isi/ Contents Standard) Chemistry Subjects stated that the purpose of high school chemistry course is that students to cultivate scientific attitude is honest, objective, open, resilient, critical, and can cooperate with others [1].

Beyer (in Filsaime, 2008) defines that "critical thinking means making judgments that reasonable". This opinion states that critical thinking means moving brain activity to assess the quality of something [2].

Based on the results of questionnaires in class XI IPA 1 SMAN 1 Kebomas-Gresik, 65% of students stated they were rarely given exercises to analyze, evaluate and solve the problem of chemical problems. The main priority of the current educational system is to educate children about how to learn and think critically.

Many experts reveal about critical thinking, one of them is critical thinking according to Watson and Glaser (1980) stated that critical thinking is the incorporation of attitudes, knowledge, and skills and competencies contained in the critical thinking that is presented with critical thinking skills [3].

Results of research conducted by Redhana (2008) on the critical thinking learning programs found that 47.5% chemistry teachers did not know about the learning critical thinking skills, 85% of teachers reported to have never designed a chemical model of critical thinking or learning programs [4]. This suggests that the critical thinking skills not be the main objective in learning yet.

One material of Reaction rate to learn about the factors that affect the rate of reaction. The material is not enough understood the concept but also need to be observed through scientific activities such as doing experiment, this activity is very important to prove the concepts that already exist.

Based on the results of questionnaire pre subsequent studies found that 58% of students still have difficulty in learning chemistry because chemistry course is a combination of learning process that includes memorization system, understanding concepts, and calculations. In fact, the rate of reaction is much component that requires students to be able to think scientifically to solve the problems in everyday life. To support and treat critical thinking process on the reaction rate matter, it is necessary to develop a student worksheet which oriented contextual approach.

The Learning process which contextual approach oriented is a learning strategy that emphasizes student engagement process fully to be able to find the material studied and relate it to real life situations that encourage students to be able to apply them in their lives [5].

The process of discovering (inquiry) is very important in contextual approach. In addition according to Zayadi (2005), inquiry or process of locating a core part of the learning contextual reasons, when someone finds something that is searched, the person's memory will be more attached than other people who find it [6].

Based on the results of questionnaires to the students of SMAN 1 Kebomas-Gresik, 68% of students stated that the school has not used student worksheet that can help students understand the material in the chemistry learning, in other words the use of student worksheet in the learning process can be said to be less than the maximum.

Learning material that developed was followed to students needs and competencies had been achieved. So, it as important to develop students worksheet that fulfill many feasibility criteria include suitability with contextual approach, content, presentation, language, and graphical the after being given the student worksheet, students can be trained to use the critical thinking skills.

METHOD

This type of research is developmental research. The method used is Research and Development (R & D)[7].

There are 10 steps in the development of this model, namely the potential and problems, data collection, product design, validation of design, design revisions, limited trial, revision of product, utility testing, product revision, and the massive production. However, this study only to test the feasibility so that the step method development R & D is limited to sixth step, namely limited trial.

The target of this research is student worksheet contextual approach oriented to treat critical thinking skills. Sources of data obtained from one chemistry lecturer, 2 chemstry teachers and 15 students of class X SMA Negeri I Kebomas-Gresik.

The research instrument used was as follows:

1. Review Sheet

Data review sheets were analyzed by qualitative descriptive study to provide an overview of the suggestions that have been given by the Chemistry Lecturer and Chemistry teacher-related aspects are reviewed.

2. Validation Sheet

The analysis was conducted on every aspect of the criteria associated with each component content, presentation, language and graphical. Percentage of questionnaire data was obtained by Likert scale calculation present in table 1.

Table 1 Likert Scale

Assesment	Scale Values
Very Good	5
Good	4
Quite	3
Poor	2
Very Poor	1

[8]

Percentages data are calculated by the formula:

$$P\% = \frac{result\ of\ data\ collection\ score}{criterion\ score}\ x\ 100\%$$

Criterion score = highest score x number of aspects of x number of respondents

The table shows the percentage of the interpretation scores validation assessment of the student worksheet are presented in table 2.

Table 2 Criteria Score Interpretation

Percentage	Criteria
0% - 20 %	Very poor
21 % - 40 %	Poor
41 % - 60 %	Quite
61 % - 80 %	Good/appropriate
81 % - 100 %	Very good/very appropriate

[8]

Based on the table 2, student worksheet is feasible if the percentage of ≥61% for all criteria.

3. Observation of student activity sheets.

All activities are in accordance with the students' learning activities were observed and recorded by researchers in the observation sheet activities of students during the activity.

Data obtained percentages are calculated by the formula:

$$\%\ activity = \frac{\Sigma frequenct\ activity\ appears}{\Sigma\ total\ frequency\ of\ overall\ activity}\ x\ 100\%$$

4. Critical thinking skills test sheet.

Critical thinking skills of students is determined by an objective test to the issue of pre-test and post-test oriented students' critical thinking skills.

Value of pre-test and post-test student is determined by using the formula:

$$score = \frac{students\ score}{maximu\ score}$$

The score obtained is used to determine the level of students' critical thinking skills to the criteria presented in Table 3.

Table 3 Interpretation Skills Scores Berpikir Kritis

Score	Criteria
0 - 20	Very poor
21 - 40	Poor
41 - 60	Quite
61 - 80	Good/appropriate
81 - 100	Very good/very appropriate

Source : Adaptaition from Riduwan(2010)

The score obtained is used to determine the level of students' critical thinking skills to the criteria presented in Table 3.

Testing criteria reject H_0 if the data is $x^2 \geq x^2_{(1-\alpha)(k-3)}$ with significance level $\alpha = 0{,}05$. In another case H_0 is accepted, which means the data is normally distributed.

Results of pre-test and post-test is then performed paired sample t-test or paired t-test

is used to determine the significant differences between the pre-test and post-test using SPSS subset of the statistics test.

Criteria for testing H_0 is rejected if the data is $t_{hitung} > t_{tabel}$ which means that there is a significant difference between the value of the pre-test and post-test. In addition to the above statistical tests to determine the criteria for each student can be seen through the analysis of gain was calculated as follows:

$$g = \frac{(posttest - pretest)}{(100 - posttest_{max})}$$

Furthermore, students' scores converted by the following criteria:

g > 0,7 = high
0,7 < g < 0,3 = moderate
g < 0,3 = low

5. Questionnaire responses to the students' learning.

This questionnaire was prepared based on the Guttman scale (X) is expressed in the form of a question. The questionnaire was assessed using the criteria of scale that can be seen in the following table:

Tabel 4 Guttman Scale

Answer	Value/score
Yes	1
No	0

[8]

Data obtained percentages are calculated by the formula:

$$\text{percentage (\%)} = \frac{result\ of\ data\ collection\ score}{criterion\ score}\ x\ 100\%$$

Based on the analysis of data obtained by questionnaire will then be converted using the interpretation of scores as in Table 2.

RESULTS AND DISCUSSION

The result of this study had been conducted at SMAN 1 Kebomas Gresik, and this discussion shown below.

1. Student Worksheet Feasibility
   Feasibility of students worksheet is presented on figure 1:
   a. Suitability with Contextual Approach Oriented Criteria
      Based on Figure 1, the feasibility of student worksheet suitability with this contextual approach gets very feasible category with a percentage rating of 81.87%. This shows that the student worksheet that developed has fulfilled 7 contextual component.

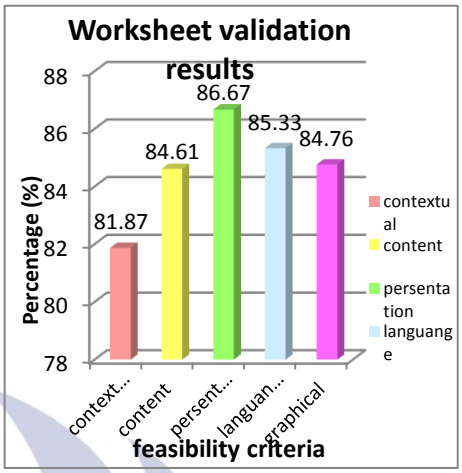

Figure 1 Graph of Validation Result of Student worksheet.

   b. Content Criteria
      Student worksheet feasibility on contents criteria gets very feasible category with a percentage rating of 84.61%. This shows that the student worksheet are fulfilled developed the criteria of either the contents on it are in accordance with the criteria contained indicators and critical thinking skills by Watson and Glaser (1980) include: inference, assumptions, deduction, interpretation, and evaluation [3].
   c. Presentation Criteria
      The feasibility criteria for the presentation get as 86.67% with very feasible category. This suggests that the student worksheet that developed fulfilled good according to Instructional Materials Development Guide from the National Education Ministry [9].
   d. Language Criteria
      Language feasibility criteria get a percentage of 85.33% with very feasible category. This shows that the student worksheet that were developed to follow the rules of Indonesian EYD (Ejaan Yang Disempurnakan/ enhanced spelling) corrected and clear by Oktafiana (2012) [10].
   e. Graphical Criteria
      Feasibility for graphical criteria get 84.76% with very feasible category. It indicates that the student worksheet was fulfill developed graphical criteria was good by Panduan

Pengembangan Bahan Ajar by Depdiknas (2008) [9].

2. Observation of Student Activity

Results of student activity observation is shown on figure 2:

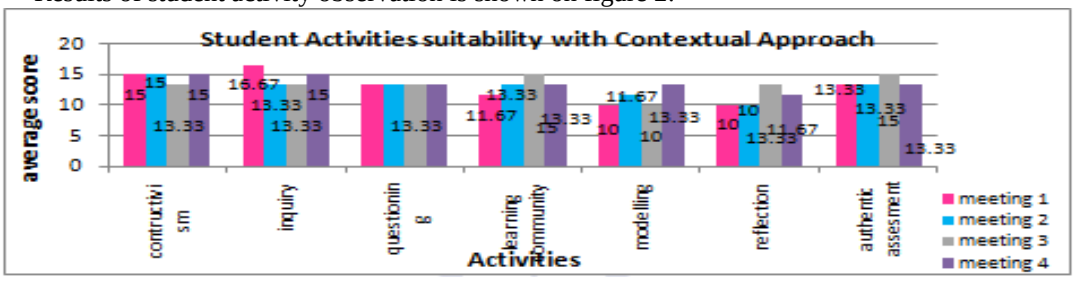

Figure 2 Graph of Student Activity Suitability with Contextual Approach

Based on Figure 2, the observation of students' activities when given a student worksheet that was developed is shown that the students, including quite active in learning but shows a fluctuation graph in each meeting. This is caused by students are still having difficulties when inquiry activities take place. This is suitable to Sanjaya (2006) stated that the teachers are not preparing for a material to be memorized, but designing learning that allows students to find their own material to be understood [5]. In the research process, the researcher assisting students when students have difficulties when the inquiry is ongoing activities.

Results of student activity observation is shown on figure 3:

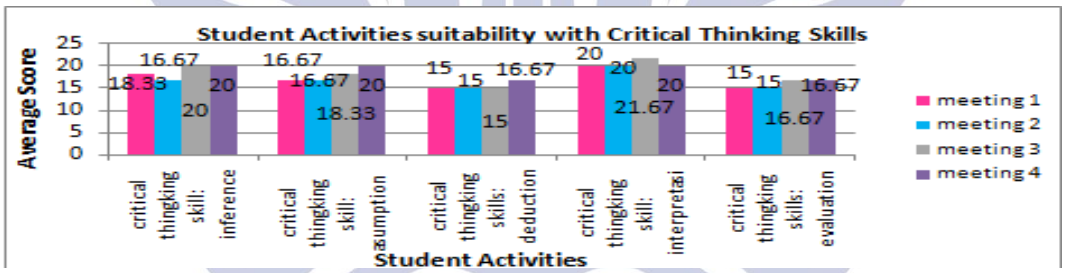

Figure 3 Graph of Student Activity Suitability with Critical Thinking Skills

Based on Figure 3 the observation of activity when students are given student worksheet that are developed can be seen that the students, including quite active in learning but shows a graph up and down in each meeting. This is because students are still having difficulties when critical thinking skills are practiced.

.

3. Students critical thinking skills test

Results of Students critical thinking skills test observation is shown on figure 4:

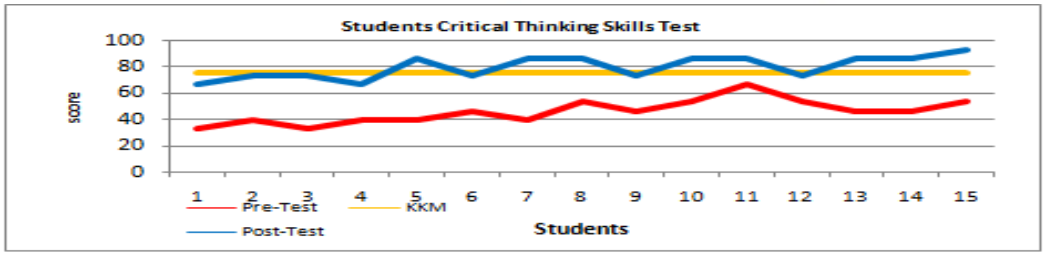

Figure 4 Graph of Students critical thinking skills test

Based on Figure 4 the results of the test of critical thinking skills (pretest) of 6 students are at intervals of 33 to 39.7. It shows that the students have a level of

 ISSN: 2252-9454

critical thinking skills which lacking. 9 While other students are in the interval from 46.4 to 66.5. It shows that these students have a level of critical thinking skills sufficient.

After being given student worksheet Contextual Approach oriented to treat Critical Thinking Skills subject matter reaction rate can be seen by Figure 4, the results of the test of critical thinking skills (post-test) of 8 students is in the interval 75-100. It shows that the students have a level of critical thinking skills which very good. While 7 other students are at intervals of 50-74. It shows that these students have a good level of critical thinking skills.

Pre-test values obtained by the students and then test the normality with the results in figure 5, which states that the data is said to be normally distributed or not is look at the numbers on Assymp. Sig. (2-tailed). There are two kinds of assumptions based on the significance of the numbers are:

a) the data are normally distributed if the value of significance (p)> 0.05.
b) The data distribution is not normal if the significance value (p) <0.05.

Referring to figure 5 variable data pre-test has more significance than 0.05 (0.849> 0.05). That is, the data pre-test variables are normally distributed.

One-Sample Kolmogorov-Smirnov Test

		pretes_fik
N		15
Normal Parameters[a]	Mean	45.9533
	Std. Deviation	8.94131
Most Extreme Differences	Absolute	.158
	Positive	.158
	Negative	-.121
Kolmogorov-Smimov Z		.611
Asymp. Sig. (2-tailed)		.849

a. Test distribution is Normal.

Figure 5 Calculation of Normality Test

Value of the pre-test and post-test is then conducted paired sample t-test with a result which states that there are significant differences between the pre-test and post-test has done paired sample t-tests are presented in Figure 6.

Paired Differences					t	df	Sig. (2-tailed)
Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
-3.39467E1	8.57520	2.21411	-38.69546	-29.19788	-15.332	14	.000

Figure 6 Calculation paired sample t-test

Based on the figure above it can be seen that the calculate t = 15.332 with a significance level α of 0.05 and t table = 2145. T caculatation is greater than t table so that there are significant differences between the pre-test and post-test which was conducted.

4. Results of Student Response
   Results of student responses is shown on figure 7:

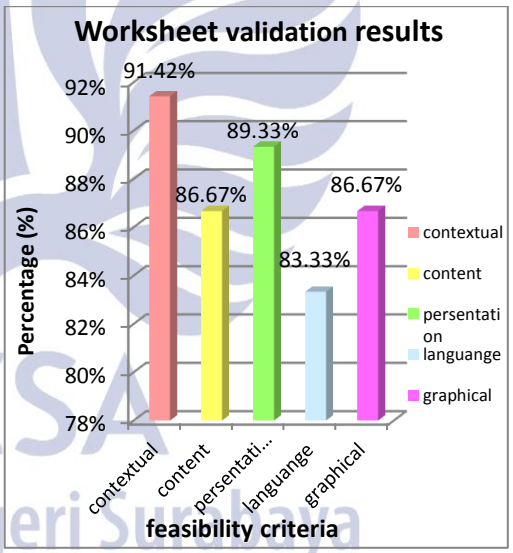

Figure 7 Graph of Students Response Results

Based on Figure 7 indicated that the assessment of the student worksheet that students developed a very feasible used with a percentage of all aspects of each get a percentage above 81%.

These results indicate that student worksheet-contextual approach oriented is a teaching system that matches the brain which produce meaning by linking academic content to the context of the everyday life of

students, it is in line with the theory of meaningful learning according to Ausubel stated that meaningful learning occurs when there is a process of linking new information to relevant concepts which already exist in the person's cognitive structure.

CLOSING

Conclusion

Based on the results and discussion of this study concluded that the student worksheet which Contextual Approach Oriented to Train Critical Thinking Skills can be concluded that:

1. Feasibility student worksheet get a percentage based on suitable criteria to the contextual feasibility get as 81.87% with very feasible category; content criteria get as 84.61% with very feasible category; presentation criteria get as 86.67% with very feasible category; linguistic criteria get as 85.33% with very feasible category; and graphical criteria get as 84.76% with very feasible category.
2. Students activity obtained a percentage of 91.85% is based on suitability with Contextual Approach Oriented and get a percentage of 88.35% is based on suitability with the critical thinking skills.
3. Critical thinking skills of students after using the student worksheet showed that 53.33% of students have a level of critical thinking skills are excellent and 46.67% of students have a good level of critical thinking skills.
4. Students Response to the student worksheet obtained a percentage of 91.42% based on the contextual suitability criteria; 86.67% based on the content criteria; 89.33% based on the presentation criteria; 83.33% based on linguistic criteria; and 86.67% based on graphical criteria.

Suggestion

1. The research is only conducted until a limited trial phase, therefore the next research is expected to be conducted until the dissemination phase.
2. During use student worksheet need to be considered the time allocation adjustment.

BIBLIOGRAPHY

1. Badan Standar Nasional Pendidikan (BSNP). 2006. *Standar Isi untuk Satuan Pendidikan Dasar dan Menengah: Standar Kompetensi dan Kompetensi Dasar SMA/MA.* Jakarta: Badan Standar Nasional Pendidikan.
2. Filsaime, Dennis K. 2008. *Menguak Rahasia Berpikir Kritis dan Kreatif.* Surabaya: Prestasi Pustaka Publisher.
3. Watson, Goodwin dan Glaser Edwin. 2002. *Watson-Glaser Critical Thinking Appraisal-UK Edition*. London: Pearson.
4. Redhana, I Wayan dan Liliasari. 2008. *Program Pembelajaran Keterampilan Berpikir Kritis Pada Topik Laju Reaksi untuk Siswa SMA.* Forum Kependidikan, Vol. 27, No. 2, Maret 2008.
5. Sanjaya, Wina. 2006. *Strategi Pembelajaran Berorientasi Standar Proses Pendidikan*. Jakarta: Kencana.
6. Zayadi, Ahmad dan Majid, Abdul. 2005. *Tadzkirah, Pembelajaran Pendidikan Agama Islam (PAI) Berdasarkan Pembelajaran Kontekstual*. Jakarta: PT Raja Grafindo Persada.
7. Sugiyono. 2012. *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung: CV Alfabeta.
8. Riduwan, 2010. *Skala Pengukuran Variabel-variabel Penelitian.* Bandung: Alfabeta.
9. Depdiknas. 2008. *Panduan Pengembangan Bahan Ajar*. Jakarta:Direktorat pembinaan Sekolah Menengah Atas, Direktorat Jendral Manajemen Pendidikan Dasar dan Menengah, Departemen Pendidikan Nasional.
10. Oktafiana. 2012. Upaya Meningkatkan Kemampuan Menulis Berita Pada Siswa Kelas VII A SMP 10 November Binangun dengan Pendekatan Kontekstual Tahun Pelajaran 2010-2011. *S1 Thesis*, Universitas Muhammadiyah Purwokerto.